



Intraplexal Aneurysm of the Distal Segment of the Anterior Choroidal Artery: A Case Report and Review of Literature

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Abstract

Keywords

- anterior choroidal artery
- aneurysms
- BrainPath
- internal carotid artery
- lateral ventricles
- posterior communicating artery
- temporal horn

Aneurysms of the anterior choroidal artery (AChA) are the most common pathology of the vessel. Although proximal aneurysms at the internal carotid artery (ICA) and AChA junction are common, their occurrence in the distal segment of the AChA is quite rare. We report a case of a distal AChA aneurysm occurring in the intraplexal segment of the AChA. To our knowledge, this is the first reported case of an intraplexal distal AChA aneurysm.

Introduction

Anterior choroidal artery (AChA) aneurysms are the most common pathology involving the vessel. Proximal aneurysms, at the junction of the internal carotid artery (ICA) and AChA, comprise 2 to 5% of all intracranial aneurysms; however, aneurysms involving the distal segments, cisternal and intraventricular, of the AChA are highly infrequent.¹ As of 2018, Yu et al reported that there have been only 40 cases.² Additionally, an extensive case series by Winkler et al in 2019 reported 146 cases of AChA aneurysms to describe a *systematic approach* to reduce ischemic complications; none of

these cases included postplexal distal AChA aneurysms, highlighting their rarity.³ We also conducted a literature search using PubMed and found four more cases since 2019.^{4–6} Due to their relatively small size and deep location, the management of distal AChA aneurysms is challenging. Additionally, there has been no unified approach to the management of such aneurysms. We report a case of a 73-year-old man who presented with intraventricular hemorrhage (IVH). The patient was found to have a right intraventricular AChA aneurysm within the choroid plexus of the lateral ventricle. We also review the literature regarding the clinical significance of the AChA and its pathologies.

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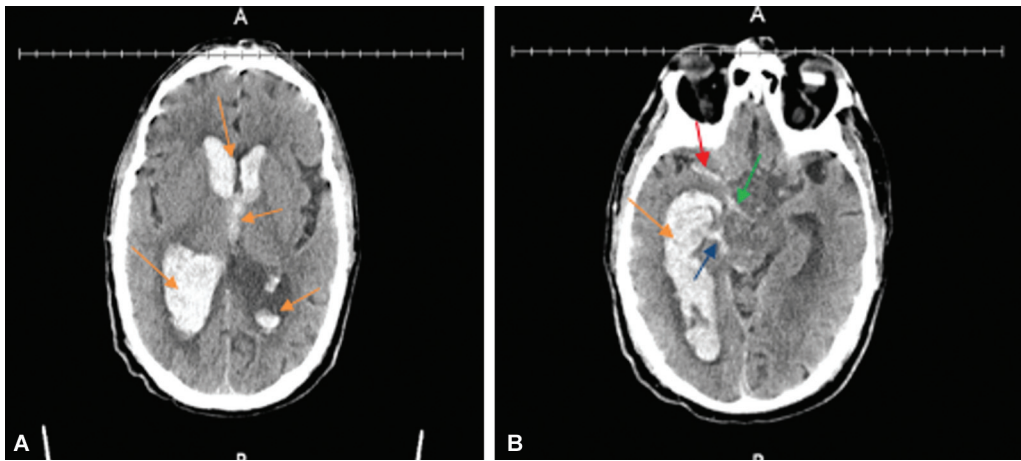


Fig. 1 (A) Extensive intraventricular hemorrhage in the right and left lateral ventricles as well as the third and fourth ventricles (not shown in image). (B) Extension of hemorrhage into the right sylvian cistern (red arrow), basal cistern (green arrow), and right ambient cistern (blue arrow).

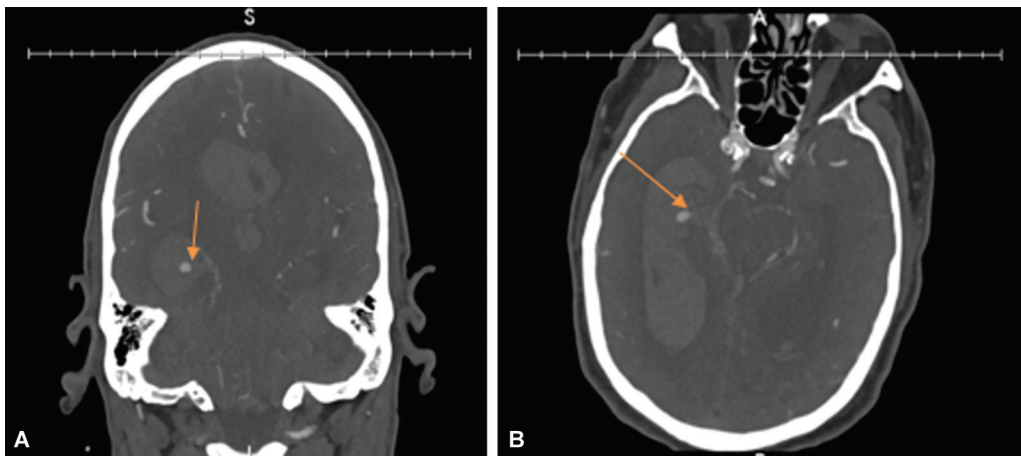


Fig. 2 (A) Coronal and (B) axial head computed tomography angiography (CTA) showing a $5 \times 4 \times 4$ mm lobulated enhancing structure in the right temporal horn with a tiny vascular pedicle (orange arrows).

Case Presentation

The patient is a 73-year-old man who presented with altered mental status and a Glasgow Coma Scale (GCS) of 7. The patient was positive for cough and gag reflexes, withdrawal of bilateral lower extremities, and right upper extremity localization. The patient had no response on the left upper extremity. Corneal reflex and pupil reactivity were present on the right and minimal to absent on the left. There was no history of recent trauma. Noncontrast head computed tomography (CT) showed extensive intraventricular as well as extraventricular hemorrhage (►Fig. 1). Head and neck CT angiography (CTA) revealed a $5 \times 4 \times 4$ mm lobulated enhancing structure that is associated with a vascular pedicle, shown in ►Fig. 2. CTA also showed multiple intracranial stenoses involving vessels in the anterior and posterior circulation. Right internal carotid digital subtraction angiography (DSA) revealed an intraplexal fusiform aneurysm of the right AChA, measuring $3.1 \times 2.2 \times 3.1$ mm, as shown in ►Fig. 3. Critical stenosis and atherosclerotic disease were also noted at the origin of the AChA, rendering the aneurysms nonamenable to endovascular intervention.



Fig. 3 Right internal carotid digital subtraction angiography (DSA) revealed an intraplexal fusiform aneurysm of the right anterior choroidal artery (AChA), measuring $3.1 \times 2.2 \times 3.1$ mm.

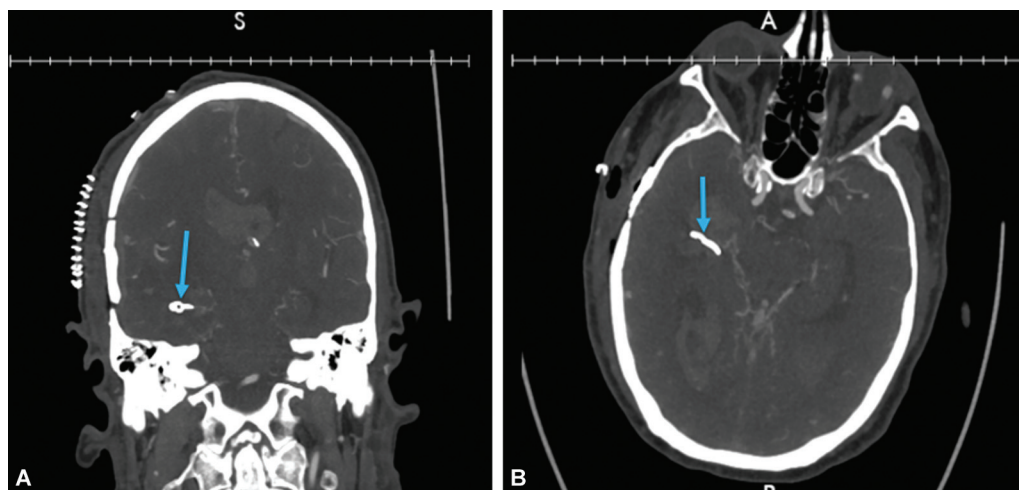


Fig. 4 (A) Coronal and (B) axial head computed tomography angiography (CTA) showing clip placement and complete obliteration of the aneurysm (blue arrows).

The patient underwent a right-sided transtemporal transventricular craniotomy with stereotactic navigation and BrainPath deployment. After the identification of the right temporal sulcus, a 50 mm × 11 mm BrainPath was used to access the right temporal horn of the lateral ventricle. Clearing of the intraventricular hematoma revealed the aneurysmal sac and its vascular pedicle. A microvascular Doppler was used for confirmation. Two 5-mm Yasargil mini-clips were placed to secure the aneurysm. Postoperative DSA showed incomplete obliteration and persistent filling of the aneurysm. The patient underwent a second operation and placement of another clip, which was sufficient to achieve complete obliteration (►Fig. 4). The patient exhibited initial improvement and was extubated 2 weeks after surgery; however, persistent hydrocephalus and gradual clinical decline ensued. The patient's family declined further interventions and decided to transition the patient to palliative care 1 month after surgery.

Discussion

Anatomy and Clinical Significance of the Anterior Choroidal Artery

French physician Vicq d'Azyr was the first to describe the AChA in the 1700s. He is also credited for many other significant discoveries, including the locus coeruleus and substantia nigra. The AChA originates from the posterior aspect of C7, also known as the communicating segment, of the ICA. The AChA branches approximately 2 to 5 mm distal to the origin of posterior communicating artery (PCoA). A variable number of perforator vessels, ranging from 0 to 4, arise between the PCoA and the AChA. These vessels supply portions of the mesial temporal lobe laterally, the optic tract medially, and the posterior perforated substance superiorly. The AChA consists of the cisternal segment, averaging 25 mm in length, and the intraventricular segment. The cisternal segment extends from the origin of the vessel to the choroidal fissure. The intraventricular segment is defined as the distal AChA beyond the plexal point, the point at which the

AChA enters the lateral ventricle through the choroidal fissure.^{1,2}

The AChA supplies critical areas of the brain, including the posterior limb of the internal capsule, the medial pallidum, the optic tract, the lateral geniculate nucleus, the medial temporal lobe, and the choroid plexus. For this reason, the clinical significance of the AChA extends far beyond its relatively small size.¹

Pathologies Involving the AChA

The main pathologies involving the AChA are aneurysms, infarcts, and tumors. Infarcts are rare and they are most commonly cardioembolic in origin. Leys et al showed that most AChA infarcts are due to large vessel disease rather than small vessel disease, as was previously presumed.⁷ Levy et al showed that embolic occlusion of the ICA was the main mechanism for AChA territory infarcts.⁸ Although the AChA forms anastomotic branches with the posterior cerebral artery (PCA) and the posterior choroidal artery, branches that supply the posterior limb of the internal capsule lack such collaterals. For this reason, infarcts involving the AChA can present with contralateral hemiplegia, hemianesthesia, and homonymous hemianopsia without cortical signs, such as aphasia.^{1,2,7-10} The constellation of these symptoms is also regarded as the anterior choroidal artery syndrome (ACAS), first described by Foix et al in 1925.¹⁰

The AChA can serve as a significant feeder for tumors near the lateral ventricles. Involvement of the AChA in choroid plexus papillomas, meningiomas, and intraventricular gliomas has been reported.¹¹⁻¹³ For this reason, preoperative embolization of the AChA is strongly recommended to facilitate the surgical resection of such tumors. Embolization is performed distal to the plexal point, as close as possible to the tumor, to minimize risk of ACAS and neurological deficits due to proximal AChA occlusion.

AChA aneurysms at the junction of the ICA and AChA are the most common pathology, and they account for approximately 2 to 5% of all intracranial aneurysms; however,

aneurysms of the distal AChA are extremely rare. Distal aneurysms more commonly occur beyond the plexal point compared with the cisternal segment. Proximal AChA aneurysms share common etiologies with other saccular aneurysms; however, distal AChA aneurysms have been closely associated with moyamoya disease, believed to be the result of vascular stress while serving as collaterals.²

Management of AChA Aneurysms

Endovascular embolization and surgical clipping are the main management strategies for AChA aneurysms. Due to the critical brain areas supplied by the AChA, these procedures carry the risk of ischemia and ACAS development. Kim et al compared the clinical outcomes and procedure-associated complications between endovascular coiling and surgical clipping. There was no significant difference in clinical outcomes, although endovascular coiling had lower rates of AChA infarctions.¹⁴

Surgical clipping of intraventricular AChA aneurysms is quite challenging. This can be attributed to the narrow operative corridor, proximity to critical brain structures, and relatively small vessel size. Additionally, the low incidence of distal intraventricular aneurysms hinders the accumulation of surgical experience. Two surgical approaches have been described in most operated cases of intraventricular AChA aneurysms: the transtemporal transventricular approach and the transchoroidal fissure approach.^{5,15} To our knowledge, there have been no approaches that deployed BrainPath for intraventricular AChA aneurysm clipping.

Conclusion

Distal AChA aneurysms are rare. This is the first reported case of an intraplexal distal AChA aneurysm. Although rare, this report emphasizes the significance of considering intraventricular AChA aneurysms as a potential cause of IVH. We also introduced the successful application of BrainPath in distal AChA aneurysmal clipping.

Conflict of Interest

None declared.

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